

ADVANCES IN MATERIALS ENGINEERING

Volume 1

Edited By:
Zahurin Halim
Iskandar Idris Yaacob
Md Abdul Maleque



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

ADVANCES IN MATERIALS ENGINEERING VOLUME 1

Edited By:

Zahurin Halim
Iskandar Idris Yaacob
Md Abdul Maleque



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

ISBN: 978 -967-418-167-3

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

Table of Content

Chapter 1 Preparation and Characterization of Thermoplastic Natural Rubber (TPNR) Nanocomposites	1
<i>Noor Azlina Hassan, Sahrim Hj. Ahmad, Rozaidi Rasid and Norita Hassan</i>	
Chapter 2 Polymer Clay Nanocomposites: Part I	6
<i>Noor Azlina Hassan and Norita Hassan</i>	
Chapter 3 Effect of Processing Parameters on the Tensile Properties of TPNR Reinforced Short Carbon Fibre Composite	11
<i>Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid</i>	
Chapter 4 Effect of Maleic Anhydride Polyethylene on Damping Properties of HDPE/EPDM Nanocomposite	16
<i>Hazleen Anuar, Nur Ayuni Jama, and Shamsul Bahri Abdul Razak</i>	
Chapter 5 Comparative Study on the Effect of Plasticizer on Thermal Properties of Polylactic Acid	22
<i>Hazleen Anuar and Muhammad Rejaul Kaiser</i>	
Chapter 6 Quality of Copper Film Electroplated on Silicon Wafer Using Different Current Densities	28
<i>Shahjahan Mridha</i>	
Chapter 7 Laser Nitriding of Titanium	39
<i>Shahjahan Mridha</i>	
Chapter 8 Composite Coating on Titanium Alloy Using High Power Laser	45
<i>Shahjahan Mridha</i>	

Chapter 9	
Measurement of Moisture Absorption in Borophosphosilicate Glass (BPGS) Films	50
	<i>Shahjahan Mridha and Shiau Khee Tang</i>
Chapter 10	58
The Effect of Processing Parameter on Tensile Properties of Thermoplastic Natural Rubber Nanocomposites	
	<i>Noor Azlina Hassan, Sahrim Hj. Ahmad, Rozaidi Rasid and Norita Hassan</i>
Chapter 11	64
Comparison of Mechanical Properties Between Untreated and Sulphuric Acid Treated Short Carbon Fiber Reinforced Thermoplastic Natural Rubber (TPNR) Composite	
	<i>Noor Azlina Hassan, Norita Hassan, Sahrim Hj. Ahmad and Rozaidi Rasid</i>
Chapter 12	69
Water Absorption of TPNR Reinforced Short Carbon Fibre Composite	
	<i>Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid</i>
Chapter 13	74
Enhanced Tensile Strength with Sulphuric Treated Short Carbon Fibre	
	<i>Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid</i>
Chapter 14	79
Effect of Fibre Length on Tensile Properties of TPNR-Kenaf Fibre Composite	
	<i>Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid</i>
Chapter 15	84
Effect of Nanoclay on Mechanical Properties of PLA-Clay Nanocomposite	
	<i>Hazleen Anuar and Muhammad Rejaul Kaiser</i>
Chapter 16	90
Extraction of Glucose From Kenaf Core by Using Chemical Pre – Treatment Process	
	<i>Nurhafizah Seenii Mohamed, Hazleen Anuar, Maizirwan Mel, Rashidi Othman, Nur Aisyah Mohd Norddin, Nur Aimi Mohd Nasir, Mohd Adlan Mustafa Kamalbhrrin</i>
Chapter 17	96
Wear of Nitride Coating Produced by Ti-Al Melt Synthesis in Nitrogen Environment	
	<i>Shahjahan Mridha</i>
Chapter 18	
Effect of Dispersant on Protein Foaming-Consolidation Porous Alumina Containing Hydrothermal Derived Hydroxyapatite Nanopowder	103
	<i>Iis Sopyan and Ahmad Fadli</i>

Chapter 19	109
Effect of Yolk Addition on Protein Foaming-Consolidation Porous Alumina-Calcium Phosphate Composites	
<i>Iis Sopyan and Ahmad Fadli</i>	
Chapter 20	115
Investigation of the Effect of Starch Addition on Protein Foaming-Consolidation Porous Alumina Containing Hydroxyapatite Nanopowder	
<i>Ahmad Fadli', Iis Sopyan, Nur Syahidah and Nur Nadia</i>	
Chapter 21	120
The Influence of Hydroxyapatite Loading on Protein Foaming-Consolidation Porous Alumina Sintered at 1300°C	
<i>Ahmad Fadli 'and Iis Sopyan</i>	
Chapter 22	126
High Density Polyethylene (HDPE) as an Alternative Material in Fuel Tank Production	
<i>Afiqah Afdzahuddin and Md Abdul Maleque</i>	
Chapter 23	132
Porous Alumina-Hydroxyapatite Composites via Protein Foaming-Consolidation Method: Effect of HA Loading on Physical Properties	
<i>Iis Sopyan, Ahmad Fadli and Nur Izzati Zulkifli</i>	
Chapter 24	137
Preparation and Characterisation of Low Density Polyethylene/Layered Silicate Nanocomposites	
<i>Salina Sharifuddin , Iskandar Idris Yaacob</i>	
Chapter 25	144
Effects of Sodium Dodecyl Benzene Sulphonate (NaDBs) on Li Imide-PMMA Based Solid Polymer Electrolyte	
<i>Fauziah Mohd Yusof and Iskandar Idris Yaacob</i>	
Chapter 26	149
Effect of Milling Time on Mechanochemically Synthesized Nanohydroxyapatite Bioceramics	
<i>Iis Sopyan, S. Adzila and M. Hamdi</i>	
Chapter 27	155
Morphological Analysis of Mechanochemically Synthesized Nanohydroxyapatite Bioceramics	
<i>Iis Sopyan, S. Adzila and M. Hamdi</i>	
Chapter 28	160
Sodium Doped Nanohydroxyapatite Bioceramics through Mechanochemical Synthesis	
<i>S. Adzila, Iis Sopyan and M. Hamdi</i>	

Chapter 29	165
Thermal Profile Analysis of Composite Brake Rotor	
<i>Md Abdul Maleque and Abdul Mu'min Adebisi</i>	
Chapter 30	172
The Effect of Fibre Content on Thermal Property of Coir Fibre Reinforced Cement-Albumen Composite	
<i>Faridatul Faezah Razali, Nur Humairah Abdul Razak and Zuraida Ahmad</i>	
Chapter 31	178
Pulsed Electrodeposition	
<i>Suryanto</i>	
Chapter 32	184
Electroless Nickel Based Coatings From Solution Containing Sodium Hypophosphite	
<i>Suryanto</i>	
Chapter 33	189
Characterization and Utilization of Fly Ash	
<i>Suryanto</i>	
Chapter 34	195
Workability of Coir Fibre- Reinforced Cement-Albumen Composite	
<i>Nur Humairah Abdul Razak and Zuraida Ahmad</i>	
Chapter 35	201
Preparation of Rice Husk for Raw Material of Silicon	
<i>Hadi Purwanto and Nor Fazilah Mohd Selamat</i>	

Workability of Coir Fibre- Reinforced Cement-Albumen Composite

Nur Humairah Abdul Razak¹ and Zuraidda Ahmad²

^{1,2} Faculty of Engineering – International Islamic University Malaysia

✉ : zuraidda@iiu.edu.my

Keywords: workability, coir fibre, slump test, albumen, cement, concrete

Abstract. The randomly distributed short coir fibre reinforced cement based composite using egg albumen as the matrix material is among the new development of lightened concretes. This paper reported on the effect of coir fibre content on the workability performance of the cement-albumen composite. The workability is a crucial factor to ensure that the cement composite can be filled completely in the formwork while maintaining its quality during transportation and placement and it was tested via slump test. The volume fraction of fibre varies between 0, 1, 2, 3, 4, 5 and 6 wt. % while egg albumen maintains its optimum volume fraction at 65 wt. %. The mixture is made based on composite 'Rule of Mixture'. The workability property of the cement composite using water as the hardening agent is also investigated and worked as control specimen. The results show that adding fiber to the lightweight concrete mixture greatly reduces the sedimentation of aggregates during mixing and improves the uniformity of the mix; however, the slump value is reduced.

Introduction

Creation of environmental-friendly and higher performance type cement composite is considered in order to replace the existing ordinary concrete which is heavy, brittle with high water absorption rate. Due to ecological concerns, investigation on the use of natural fibre as reinforcing material has shown encouraging results [1]. Simultaneously, they are abundantly available at low cost, less abrasive and harmful to mankind and yielded lightweight product.

Coir or coconut fibre has the potential as a reinforcing material in the production of cement construction components [2-5]. It is a cheap [1-2], strong fibre which is not as brittle as glass fibre and durable [1,3], amenable to chemical modification, non-toxic, possesses no waste disposal problem [6], and exhibits useful mechanical properties. Research reported that composite made with short coir fibres and ordinary Portland cement matrix presented a significant increase in toughness [2].

In addition, egg albumen is a biopolymer which offers an interesting alternative for synthetic polymer due to its non-toxicity, harmlessness, and reliability in processing [7]. It is believed that the protein network plays an important role in providing mechanical properties for the encapsulating matrix [7]. However, little research is done on protein matrix.

Workability is a crucial factor that may affect the application and physico-mechanical properties of fibre reinforced concrete (FRC). Workability refers to the relative ease or difficulty of placing and consolidating fresh concrete. Too much stiffness concrete mixture, however, makes it too difficult to work the concrete into the forms. On the other hand, too fluid mixture is also detrimental. A favourable workability in fresh concrete is essential in ensuring the reinforcement can be filled completely, accordingly and maintained its quality during mixing, transportation, placement and compacting [8-9]. Moreover, investigation of FRC at its fresh state is vital to avoid